The Beagle, Records of the Museums and Art Galleries of the Northern Territory, 2006 **22**: 31–37

Philocheras triangulus, a new crangonid shrimp (Crustacea: Decapoda: Caridea) from the Northern Territory, Australia

T. KOMAI

Natural History Museum and Institute,
Chiba, 955-2 Aoba-cho, Chuo-ku, Chiba 260-8682, JAPAN
komai@chiba-muse.or.jp

ABSTRACT

A new species of crangonid shrimp, *Philocheras triangulus* sp. nov., is described and illustrated. Two specimens were trawled from a coral sand bottom off West Alligator Head, Kakadu National Park, Northern Territory, Australia, at a depth of 7.3 metres in 2004. The possession of a single lateral tooth on the antennal scale aligns the new species to the seven known species of the genus also having this feature, but the triangular rostrum and the lack of a distinct mid-dorsal carina on the third and fourth pleonal somites immediately distinguish the new species from its congeners. The new species is the ninth *Philocheras* species known from Australia. A key to all nine species is given.

KEYWORDS: Crustacea, Decapoda, Caridea, Crangonidae, *Philocheras*, new species, Northern Territory, Australia.

INTRODUCTION

Of the 22 genera of the family Crangonidae, including about 170 species, the genus *Philocheras* Stebbing, 1900, is remarkably speciose, represented by more than 50 species worldwide. Discovery of new species has been frequent in recent years (Bruce 1994; De Grave 2000; Kim and Hayashi 2000; Komai 2001, 2004). *Philocheras* is characterised by the usual lack of lateral teeth on the rostrum, the transversely oblong stylocerite of the antennule, the first pereiopod without an exopod, and the second pereiopod usually overreaching the extended merus of the first pereiopod. Up to the present time, eight species are known from Australia (Davie 2002; Komai 2004): *P. flindersi* (Fulton and Grant, 1902) from Victoria; *P. intermedius* (Bate, 1863) from Gulf St Vincent, South Australia; *P. lowisi* (Kemp, 1916) from Northern Territory; *P. obliquus* (Fulton and Grant, 1902) from Victoria; *P. pilosus* (Kemp, 1916) from the Northern Territory; *P. planoculminus* Bruce, 1994, from the Timor Sea; *P. victoriensis* (Fulton and Grant, 1902) from Victoria; and *P. brucei* Komai, 2004, from Cairns, Queensland.

Two specimens of a small crangonid shrimp collected during the surveys of inshore waters of the Northern Territory, Australia, were kindly made available for study by Dr Alexander J. Bruce. Close examination revealed that these specimens represent a new species of *Philocheras*, here described as *P. triangulus*. The new species is compared with *P. angustirostris* (De Man, 1918), *P. brucei* Komai, 2004, *P. incisus* (Kemp, 1916), *P. kempi* (De Man, 1918), *P. parasculptus* Burukovsky, 1991, *P. sculptus* (Bell, 1847) and *P. vanderbilti* (Boone, 1935).

The type specimens are deposited in the collections of the Museum and Art Gallery of the Northern Territory (NTM). The abbreviation CL refers to the postorbital carapace length. For detailed observations of the surface structure on the integument, the specimens (including removed appendages) were stained with a solution of methylene blue.

SYSTEMATICS

Family Crangonidae

Genus *Philocheras* Stebbing, 1900

Philocheras triangulus sp. nov.

(Figs 1–4)

Material examined. HOLOTYPE – male (CL 3.6 mm), West Alligator Head, Kakadu National Park, Northern Territory, 12°9.725'S 132°13.959'E, 7.3 m, beam trawl, coll. S.K. Horner, G.M. Dally and party, 21 November 2004, NTM Cr. 14404. PARATYPE – same data as holotype, 1 young male (CL 3.2 mm), NTM Cr. 15264.

Description. Body (Fig. 1) somewhat depressed dorsoventrally, moderately stout; integument ornamented with minute, stone-pavement-like structures (Fig. 2).

Rostrum (Fig. 3A, B) depressed dorsoventrally, directed forward, triangular in dorsal view, reaching distal margin of eyes, terminating in acute tip, about 0.2 of carapace length; dorsal surface shallowly sulcate medially; lateral margins unarmed, with row of short setae extending onto orbital margin, not covering corneal surface; ventral margin carinate medially. Carapace (Figs 1, 3A) about 1.1 times longer than broad, with short setae dorsally and laterally, but without covering of short pubescence; shallow, broad, transverse furrow posterior to rostral base; median carina very low, rather obtuse, smooth on dorsal margin, extending nearly to posterior

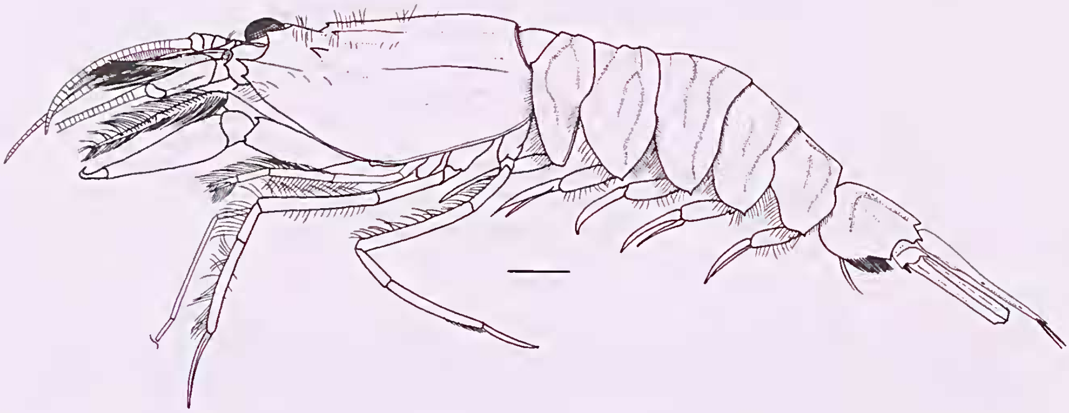

Fig. 1. *Philocheras triangulus* sp. nov. Holotype, male (CL 3.6 mm), NTM Cr. 14404. Habitus, in lateral view. Scale bar: 1 mm.

margin of carapace, terminating in small, sharp epigastric tooth at about 0.15 of carapace length; postorbital carina very low, obsolete, extending to mid-length of carapace, terminating anteriorly in small tooth slightly posterior to level of epigastric tooth; hepatic spine arising slightly anterior to level of epigastric tooth, followed by very low, obsolete ridge; branchial carina very low, but clearly delineated, extending from mid-length of carapace to level of posterodorsal margin of carapace; no other teeth present on lateral surface; orbital margin concave, without cleft; antennal tooth small, acute; branchiostegal tooth moderately long, reaching nearly to dorsodistal margin of antennal basicerite, supported by low, distinct ridge extending to level of hepatic tooth; pterygostomian tooth small.

Thoracic sternum (Fig. 3C) widened posteriorly, with long median spur on anterior margin of fifth sternite far overreaching coxae of second pereopods; each sternite of sixth to eighth thoracomere with sharp median carina terminating anteriorly in acute tooth and blunt transverse ridges; division of sternites indicated by transverse sulci; sternal surface with sparse setae.

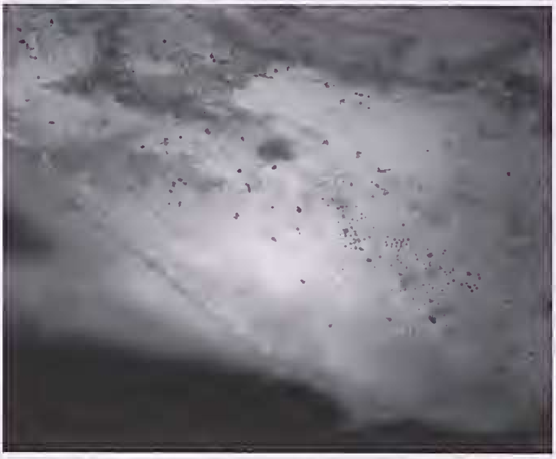

Fig. 2. *Philocheras triangulus* sp. nov. Holotype, male (CL 3.6 mm), NTM Cr. 14404. Light micrograph showing texture on tegumental surface of branchiostegite of carapace.

Third maxilliped with small arthrobranch above; pleurobranch present on each fourth through eighth thoracic somites, ventral apices all directed posteriorly.

Pleon (Figs 1, 3D) weakly sculptured by shallow transverse sulcus; surface nearly naked. Mid-dorsal carina absent on first, second and fourth somites, rudimentary on third somite; fifth somite with faint submedian carinae diverging posteriorly. First somite with 1 transverse sulcus divided in 2 branches laterally on tergum and extending onto pleuron, anterior branch extending to midpoint of pleuron; second somite with 2 transverse sulci, posterior sulcus accompanied by distinct transverse ridge on tergum, divided in 2 branches laterally on tergum and extending to pleuron, posterior branch reaching nearly to ventral margin of pleuron; third somite with 2 transverse sulci, interrupted medially, posterior sulcus longer than anterior sulcus, extending nearly to ventral margin of pleuron; fourth somite with 2 transverse sulci, anterior sulcus short, restricted to lateral surface, posterior sulcus curving toward anterior along midline in dorsal part, extending ventrally to midpoint of pleuron; fifth somite with 2 sulci, anterior sulcus restricted to lateral surface and running about midlength of pleuron, posterior sulcus running from anterior 0.2 of fifth somite along midline and then curving laterally along posterodorsal margin, extending onto pleuron. Posterodorsal margins of second and fifth somites concave, without conspicuous notch; that of third somite weakly convex; that of fourth somite nearly straight, faintly notched medially. Anterior margin of first somite with small, acute tooth laterally. Pleura of first somite slightly angular at posteroventral margin; that of second somite tapering ventrally to tiny, acute tooth; those of third to fifth somite each with small

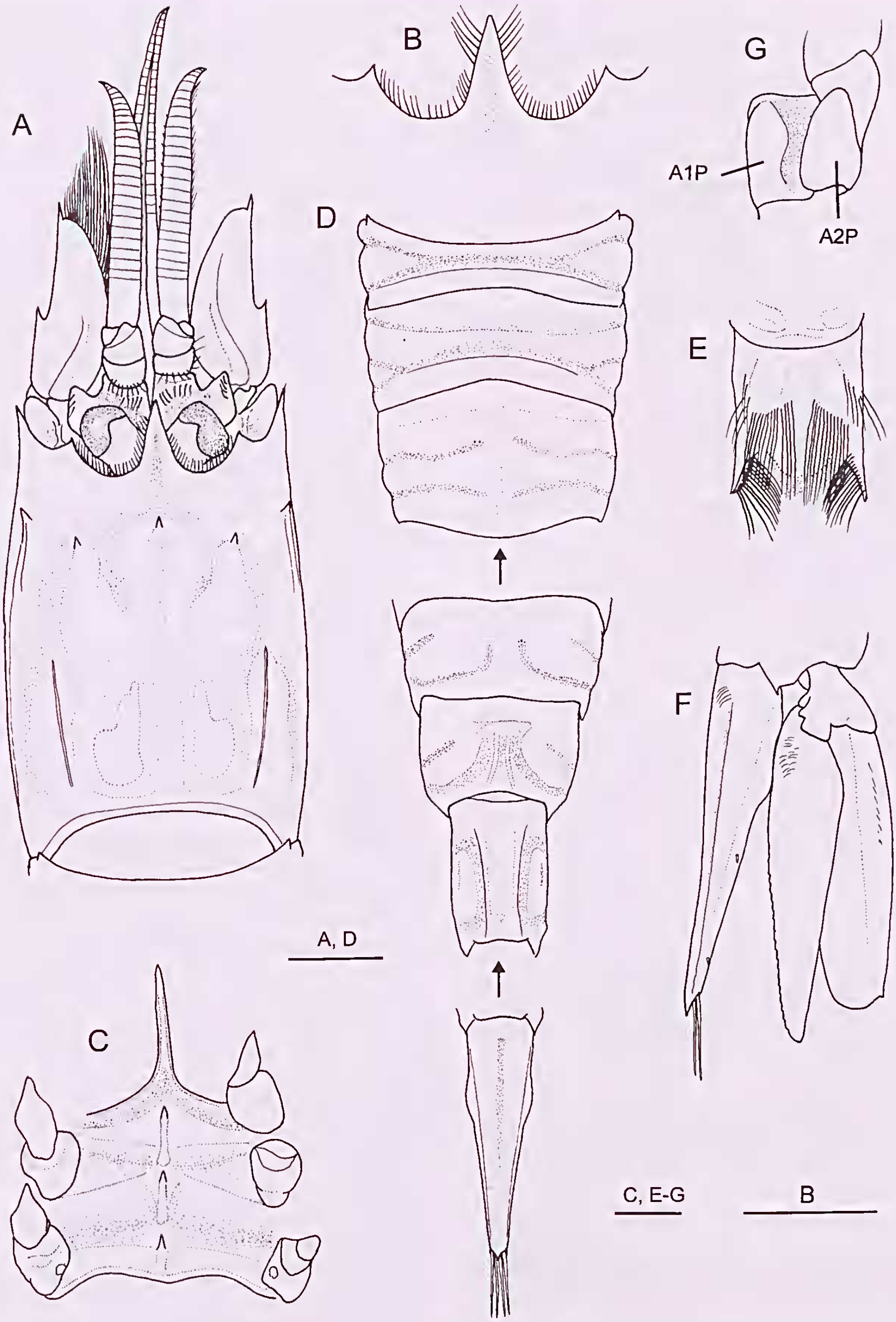

Fig. 3. *Philocheras triangulus* sp. nov. Holotype, male (CL 3.6 mm), NTM Cr. 14404. **A**, carapace and cephalic appendages, dorsal view (setae partially omitted); **B**, rostrum and orbital margins, dorsal view; **C**, thoracic sternum, ventral view; **D**, pleon and telson, dorsal view; **E**, sixth pleonal somite, ventral view; **F**, telson and right uropod, oblique lateral view; **G**, basal part of peduncles of antennae in ventral view, showing ventral concavity on first segment of antennular peduncle (setae omitted); A1P = antennular peduncle; A2P = antennal peduncle. Scales: 1 mm for A, B, D; 0.5 mm for C, E–G.

tooth at posteroventral angle. Sixth somite about 1.4 times longer than fifth somite and 1.3 times longer than high; dorsal surface with low, broad, mid-dorsal carina, without distinct median groove separating mid-dorsal carina; posterodorsal margin weakly 2-lobed; lateral surface with shallow sulcus along mid-dorsal carina curving toward ventral at anterior part; posterolateral process terminating in acute tooth; posteroventral angle acuminate; ventral surface with thick assemblage of long setae on either side of V-shaped median depression; ventral surface convex, with obliquely transverse row of long setae extending to posteroventral margin (Fig. 3E). Telson (Fig. 3D, F) moderately narrow, about 1.6 times longer than sixth somite, tapering posteriorly and terminating in small, triangular tooth; dorsal surface with shallow median sulcus, lateral margin with broad, low convexity subproximally and with 2 pairs of very small spines (anterior spines arising slightly posterior to mid-length of telson, posterior spines at about posterior 0.2 of telson); posteromedian tooth flanked by 1 pair of small spines and 2 pairs of long setulose spiniform setae.

First to fifth pleonal sternites each with blunt median tubercle becoming smaller toward posterior.

Cornea of eye (Fig. 3A) well pigmented and distinctly faceted, slightly wider than eye-stalk; corneal width 0.16 of carapace length; eye-stalk short, without dorsal tubercle.

Antennular peduncle (Fig. 3A) reaching 0.4 length of antennal scale. First segment longer than distal 2 segments combined, dorsal surface strongly excavate to accommodate eye; ventrolateral margin forming sharply delineated, sinuous ridge, lateral part of ventral surface strongly depressed (Fig. 3G); stylocerite subquadrate with anterolateral angle weakly produced and subacutely pointed, posterolateral angle rounded. Second segment wider than long, with slightly produced anterolateral angle. Third segment as wide as second segment. Lateral flagellum broad, overreaching distal margin of antennal scale by half length in male, composed of about 26 articles; mesial flagellum longer than lateral flagellum, composed of more than 20 articles.

Antenna (Figs 1, 3A) with stout basicerite bearing small ventrolateral tooth. Carpocerite stout, overreaching midlength of antennal scale. Antennal scale narrowed distally; dorsal surface naked, with distinct median ridge; lateral margin armed with conspicuous tooth arising at about 0.4 length, margin proximal to lateral tooth slightly sinuous, margin distal to lateral tooth nearly straight; distolateral tooth slender, far overreaching narrow, obliquely rounded distal margin of lamella. Flagellum longer than body.

Mouthparts not dissected. Second maxilliped with endopod composed of 6 segments with basis and ischium fused; epipod subrectangular, podobranch multilamellate. Third maxilliped (Fig. 4A) consisting of 4 segments, flattened dorsoventrally, overreaching distal margin of antennal scale (except for distolateral tooth) by half length of ultimate segment; ultimate segment slightly shorter than carpus (= penultimate segment), moderately narrow (5.4 times longer than basal width), tapering distally, mesial margin with row of long setae; carpus with short to long setae on dorsal surface and lateral margin, mesial surface with numerous transverse tracts of dense, stiff setae; antepenultimate segments (merus, ischium and basis fused segment) somewhat sinuous in dorsal view, setose on margins, setae on dorsolateral distal angle particularly elongate; ventral margin distally with short longitudinal row of 8 spinules; coxa stout, with rounded lateral process and small setose protuberance on mesial surface; exopod reaching beyond midlength of antepenultimate segment, somewhat tapering distally, bearing well-developed flagellum.

First pereopod (Fig. 4B) stout, slightly overreaching distal margin of antennal scale; palm (Fig. 4C) moderately stout, 2.7 times longer than wide, mesial surface with stiff setae or spiniform setae proximally extending to midlength between base of palm and base of pollex; cutting edge strongly oblique, with submarginal row of short setae dorsally and ventrally; pollex basally articulated, straight; dactylus somewhat curved, about half length of palm; carpus short, with small ventrodistal tooth on lateral margin and cluster of stiff setae on mesial surface; merus strongly compressed laterally, with small dorsodistal tooth, distolateral margin unarmed, ventral margin weakly sinuous, unarmed. Second pereopod (Fig. 4D, E) overreaching distal margin of carpus of anteriorly extended first pereiopod, chelate; dactylus about twice length of palm, apparently lacking unguis; chela subequal in length to carpus, with rows of long setae on dorsal and ventral margins; pollex lacking unguis; carpus shorter than merus, with row of long setae on each dorsal and ventral margins; merus and ischium with row of long plumose setae on dorsal and ventral margins; ischium slightly longer than merus. Third pereopod (Fig. 4F) very slender, overreaching distal margin of antennal scale by 0.4 of carpal length; dactylus about 0.7 length of propodus, terminating in acute tip; carpus elongate, longer than distal 2 segments combined or than merus; merus slightly longer than ischium; ischium with row of setae on dorsal and ventral margins; coxa without lateral projection. Fourth pereopod (Fig. 4G) moderately slender for genus, overreaching distal margin of antennal scale by length of dactylus; dactylus about 0.9 length of propodus, slender, weakly curved, weakly flattened dorsoventrally, terminating acutely; ventral surface of dactylus medially ridged on proximal half; propodus with row of setae on dorsal surface; carpus about half length of propodus; merus and ischium with row of setae on dorsal and ventral surfaces (dorsal setae longer than ventral setae), merus about 1.7 times longer than ischium and about 8.0 times longer than high. Fifth pereopod (Fig. 4H) similar to fourth

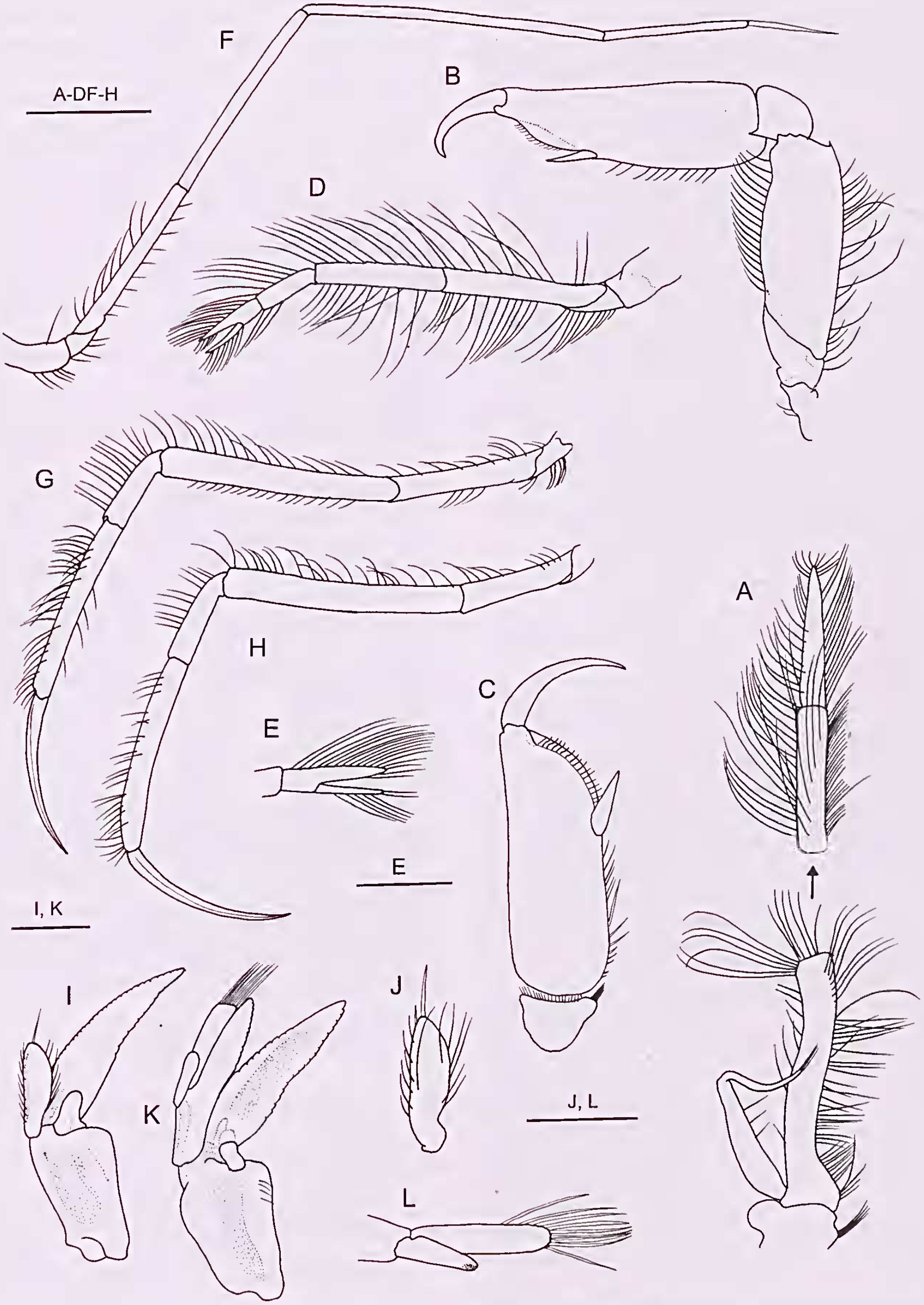

Fig. 4. *Philocheras triangulus* sp. nov. Holotype, male (CL 3.6 mm), NTM Cr. 14404. **A**, left third maxilliped, dorsal view; **B**, left first pereopod, lateral view; **C**, same, chela, dorsal view; **D**, left second pereopod, lateral view; **E**, same, chela, mesial view; **F**, right third pereopod, lateral view; **G**, left fourth pereopod, lateral view; **H**, left fifth pereopod, lateral view; **I**, left first pleopod, ventral view; **J**, same, endopod, ventral view; **K**, left second pleopod, ventral view; **L**, same, appendices interna and masculina, mesial view. Scales: 1 mm for A–D, F–H; 0.5 mm for E, I–L.

pereiopod, but slightly shorter and less setose; dactylus about 0.9 times as long as propodus.

Pleopods (Fig. 1) becoming smaller posteriorly, with stout protopods somewhat widened distally (Fig. 4I, K). Endopod of first pleopod (Fig. 4I, J) about half length of exopod, leaf-like in shape, with 1 long spiniform seta terminally and with sparse row of setae on lateral and mesial margins. Endopod of second pleopod slightly shorter than exopod (Fig. 4K); appendices interna and masculina (Fig. 4K, L) arising at 0.4 length of endopod, appendix masculina stout, about twice length of appendix interna, falling slightly short of tip of endopod, truncate terminally, with about 10 long spiniform setae distally. Endopods of third to fifth pleopods 0.7–0.8 length of exopod, each with stout appendix interna, all provided with cincinnuli.

Protopod of uropod (Fig. 3F) stout, posterolateral projection blunt terminally. Endopod of uropod (Fig. 3F) slightly longer than exopod, overreaching posterior tip of telson, tapering distally; exopod reaching tip of telson, lateral margin slightly convex, terminating in tiny tooth not reaching broadly rounded posterior margin.

Coloration in life. Unknown.

Size. Holotype (male) is adult, 3.6 mm in CL. Female is unknown.

Distribution. So far known only from the Northern Territory, Australia.

Etymology. Derived from the Latin *triangulus* (triangular) referring to the characteristic triangular rostrum of this new species.

Remarks. Only two specimens were available for study. The holotype appears to be mature as the lateral flagellum of the antennule is fully thickened (Fig. 3A), and the appendix masculina of the second pleopod is well developed (Fig. 4L). The paratype, a male (CL 3.2 mm), is immature, because the antennular flagella are slender and the appendix masculina is not fully developed, being distinctly shorter than that of the holotype and provided only with some short setae distally.

Philocheras triangulus has a distinct lateral tooth on the antennal scale, a character shared with the following seven known congeners: *P. angustirostris* (de Man); *P. brucei* Komai; *P. incisus* (Kemp); *P. kempi* (de Man); *P. parasculptus* Burukovsky; *P. sculptus* (Bell); and *P. vanderbilti* (Boone) (de Man 1920; Boone 1935; Burukovsky 1991; Komai 2004). The new species is immediately distinguished from the other seven species by the triangular rostrum terminating in an acuminate point. The rostrum of *P. incisus*, *P. kempi*, *P. parasculptus*, *P. sculptus* and *P. vanderbilti* is distinctly bifid terminally in dorsal view. In *P. angustirostris* and *P. brucei*, the rostrum is distally truncate or slightly concave in dorsal view. Furthermore, the rostrum is very slender in *P. angustirostris* and *P. kempi*. In *P. incisus*, *P. parasculptus*, *P. sculptus* and *P. vanderbilti*, it is broad with the lateral margins being subparallel or concave. The possession of only one mid-dorsal tooth (epigastric tooth) on the carapace distinguishes *P. triangulus* from *P. parasculptus*, *P. sculptus* and *P. vanderbilti*, which have two or three mid-dorsal teeth on the carapace. The absence of a posthepatic tooth separates *P. triangulus* from *P. angustirostris*, *P. incisus*, *P. kempi*, *P. parasculptus* and *P. sculptus*. Sculpture of the pleon is also different among the species under consideration. In *P. triangulus*, the pleonal sculpture is weak; the mid-dorsal carina on the second to fourth somites are absent or faint; the first to fourth somites are provided with shallow transverse sulci. In *P. angustirostris*, *P. brucei*, *P. incisus*, *P. kempi*, *P. parasculptus* and *P. sculptus*, at least the third and fourth somites are provided with a distinct mid-dorsal carina; the first to fourth somites with distinct transverse grooves or sulci bordered by sharp transverse carinae. In *P. vanderbilti*, the third and fourth somites are provided with a weak mid-dorsal carina and all somites are devoid of distinct grooves or sulci.

It is worth mentioning that much of the integument of the body is covered with a minute, stone-pavement-like microsculpture in *P. triangulus*, a feature visible under high magnification (see Fig. 2), although the detailed texture is still unclear. Bruce (1994) reported that much of the cuticle of the body and antennal scales was minutely reticulate in *Philocheras lowisi*, although in the other congenerics the detailed texture of the integument is poorly understood. Detailed observations using SEM will be effective in elucidating the detailed structure of the tegumental surface.

The present new species brings the number of species of the genus known from Australian waters to nine. All the known Australian species are shallow water inhabitants, ranging from intertidal to sublittoral depths, down to 30 m (Davie 2002; Poore 2004). Species of the genus have been recorded also from the bathyal zone (de Man 1920; Chace 1984), and therefore there is little doubt that there are many new species still awaiting discovery in Australian waters, of which the marine fauna is extremely rich.

Key to species of *Philocheras* from Australian waters

1a. Antennal scale with 1 tooth or serration on lateral margin 2

1b. Antennal scale unarmed on lateral margin........... 4

2a. Antennal scale with 1 tooth on lateral margin 3

2b. Antennal scale with serrations on lateral margin... .... *P. lowisi*
[Andaman Islands, Japan Hong Kong and Northern Territory, sublittoral to 30 m]

3a. Rostrum triangular in dorsal view, terminating in acuminate tip; third pleonal somite with trace of mid-dorsal carina .... *P. trigulus*
[Northern Territory, 7.3 m]

3b. Rostrum narrow, but not triangular in dorsal view, terminating in slightly concave or truncate tip; third pleonal somite with distinct mid-dorsal carina .... *P. brucei* [Queensland, 10 m]

4a. Third and fourth abdominal somites with mid-dorsal carina; [carapace with 3 mid-dorsal teeth including epigastric tooth, longitudinal row of 5 teeth posterior to orbit and short row of 4 small teeth posterior to branchiostegal tooth] .... *P. victoriensis* [Victoria, sublittoral]

4b. Third and fourth abdominal somites rounded dorsally.. 5

5a. Carapace with 3 mid-dorsal teeth including epigastric tooth... *P. pilosus* [Indian Ocean, New Caledonia and Northern Territory, shallow subtidal]

5b. Carapace with 1 or 2 mid-dorsal teeth including epigastric tooth 6

6a. Carapace with longitudinal row of small teeth posterior to orbit .... *P. intermedius* [Gulf St Vincent, South Australia, sublittoral]

6b. Carapace without longitudinal row of small teeth posterior to orbit.. 7

7a. Carapace with 2 mid-dorsal teeth including epigastric tooth (rostrum broad with concave lateral margins, distal margin truncate in dorsal view).................... .... *P. obliquus* [Victoria, sublittoral]

7b. Carapace with 1 mid-dorsal tooth (epigastric tooth) 8

8a. Rostrum narrow with distal margin convex and lateral margins nearly straight, parallel; carapace with 2 teeth posterior to branchiostegal tooth .... *P. flindersi* [Victoria, sublittoral]

8b. Rostrum broad with distal margin broadly truncate and lateral margins concave; carapace with 1 tooth posterior to branchiostegal tooth .... *P. planoculminus* [Flat Top Bank, Timor Sea, 30 m]

ACKNOWLEDGMENTS

I thank A.J. Bruce of the Queensland Museum for making this interesting material available for study and for reviewing the manuscript.

REFERENCES

Boone, L. 1935. Crustacea: Anomura, Macrura, Euphausiacea, Isopoda, Amphipoda and Echinodermata: Asteroidea and Echinoidea. Scientific results of the world cruise of the yacht 'Alva', 1931, William K. Vanderbilt, commanding. *Bulletin of the Vanderbilt Marine Museum* **6**: 1–264.

Bruce, A.J. 1994. Shrimps from Flat-top Bank, Timor Sea (Crustacea: Decapoda: Caridea). *Raffles Bulletin of Zoology* **42**(4): 743–756.

Burukovsky, R.N. 1991. New and rare species of shrimps from the south-east part of the Indian Ocean. *Zoologicheskii Zhurnal* **70**(1): 36–41.

Chace, F.A. Jr. 1984. The caridean shrimps (Crustacea: Decapoda) of the Albatross Philippine Expedition, 1907–1910, Part 2: families Glyphocrangonidae and Crangonidae. *Smithsonian Contributions to Zoology* **381**: 1–63.

Davie, P.J.F. 2002. *Crustacea: Malacostraca: Phyllocarida, Hoplocarida, Eucarida (Part 1)*. Wells, A. and Houston, W. W. K. (eds) *Zoological Catalogue of Australia* 19.3A. CSIRO Publishing: Melbourne.

De Grave, S. 2000. A new *Philocheras* species (Decapoda, Crangonidae) from Hansa Bay, Papua New Guinea. *Hydrobiologia* **432**: 49–56.

Kim, J.N. and Hayashi, K. 2000. Two new shrimps of the genus *Philocheras* (Decapoda, Caridea, Crangonidae) from East Asian waters. *Journal of Crustacean Biology* **20**(4): 687–698.

Komai, T. 2001. A new species of crangonid shrimp of the genus *Philocheras* (Crustacea: Decapoda: Caridea) from Hawai'i. *Pacific Science* **55**(4): 419–427.

Komai, T. 2004. A new species of crangonid genus *Philocheras* Stebbing (Crustacea: Decapoda: Caridea) from northeastern Australia. *Memoirs of the Queensland Museum* **49**(2): 665–673.

Man, J.G. de. 1920. The Decapoda of the Siboga Expedition. IV. Families Pasiphaeidae, Stylodactylidae, Hoplophoridae, Nematocarcinidae, Thalassocaridae, Pandalidae, Psalidopodidae, Gnathophyllidae, Processidae, Glyphocrangonidae, and Crangonidae. *Siboga Expeditie, Monographie* **39**a^8: 1–318.

Poore, G.C.B. 2004. *Marine decapod crustacea of Southern Australia. A guide to identification*. CSIRO Publishing: Melbourne.

Accepted 26 August 2006